



Management of skin reactions during radiotherapy in Flanders (Belgium): A study of nursing practice before and after the introduction of a skin care protocol

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A B S T R A C T

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Purpose of the research: To evaluate nursing practice in Flanders (Belgium) regarding skin care during radiotherapy and the effect of the introduction of an evidence based protocol on daily nursing practice. **Methods and sample:** Nurses working at radiotherapy departments in Flanders were invited to complete a 58-item questionnaire. The survey was undertaken in 2001 ($n = 67$) and end of 2006 ($n = 89$). Following the survey in 2001 an evidence based skin care protocol was made available for radiotherapy nurses and presented at their respective radiotherapy services.

The questionnaire asked to what extent they advised their patients about skin care topics grouped in four sections: prevention, erythema, dry desquamation, moist desquamation.

Key results: The surveys revealed large varieties in the management of skin reactions although there seems to be less variety and more consensus in the 2006 survey.

Regarding preventive advice and the advice in case of erythema, dry desquamation and/or moist desquamation a major improvement was observed in the adoption of key principles such as washing and hydrating the irradiated site and the use of occlusive dressings and the omission of outdated techniques such as talcum powder, Eosin 2% and Gentian violet.

Conclusions: The management of skin reactions does not always correspond with current scientific knowledge. However, the results of this study show that the dissemination and implementation of a skin care protocol enhanced standardization in Flanders, improved adherence to evidence based guidelines and lead to the disappearance of outdated ritualistic practices.

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Introduction and background

Some degree of skin reaction during or after radiotherapy will occur in about 90% of patients (Porock and Kristjanson, 1999; Porock et al., 1999). They can affect quality of life by causing pain and discomfort, and by limiting daily activities. The provision of skin care information to patients to limit the impact of skin reactions is essential.

As part of the multidisciplinary team nurses play an important role in informing patients undergoing radiotherapy. To evaluate this domain of care in established nursing practice in Flanders (Belgium) a survey was undertaken in 2001 to study the consensus of skin care advice (D'haese et al., 2005). The results of this study showed large variations in the prevention and management of skin reactions

among radiotherapy facilities and radiotherapy nurses. It was also shown that a great repertoire of available techniques was used which were not always evidence based. Moreover, a considerable number of nurses still used old fashioned techniques and the principles of moist wound care were rarely implemented. Two earlier and a more recent study showed similar results among radiation oncologists (Barkham, 1993; Lavery, 1995; Bolderston, 2003).

Based on the results of D'haese et al. (2005) a skin care protocol was developed after thorough literature review by five expert nurses of the Radiotherapy Study Group (RSG) of the Flemish Organization for Radiotherapy and Oncology Nurses (VVRO), and was reviewed by several radiation oncologists. This evidence-based protocol was made available for radiotherapy nurses through the society's website and was presented at several regional conferences.

The survey was reconducted in 2006 to study the efficiency of the implementation of this protocol concerning skin care in daily nursing practice. Specifically, we looked at the use of some outdated

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(e.g. the use of Eosin 2% and Gentian Violet) and controversial techniques (e.g. the use of talcum powder and hydrocortisone creams) and the adoption of key principles in skin care such as:

- A clean, well-hydrated skin by advising skin washing with mild soap and the use of topical agents. This creates an ideal environment to promote healing and patients' comfort and reduces the potential for trauma and infection.
- A moist environment promotes healing in case of moist desquamation.

Several authors report about the development and implementation process of evidence based skin care protocols (Campbell and Lane, 1996; Haisfield-Wolfe and Rund, 2000). Nystedt et al. (2005) evaluated the efficacy of the implementation process and the effect on nursing practice. They observed that practice changed from the maintenance of a dry radiation treatment area to the adoption of the key principles of skin washing and hydration, and the principles of moist wound healing. Due to the process of implementing protocols, a focus on skin care principles is provided which encourages questioning and changing of clinical practice.

Methods

Data collection

This descriptive study was coordinated by the Radiotherapy Study Group (RSG) of the Flemish Organization for Radiotherapy and Oncology Nurses (VVRO). The first part of the study was conducted in 2001, the second part in 2006. In each participating department an active member of the RSG explained the study goal and the method for completion of the anonymous questionnaires.

Sample

In 2001 nine out of thirteen radiotherapy departments in Flanders were represented by active members in the RSG and were invited to participate in the survey. Eight of these departments agreed to participate. In 2006 twelve radiotherapy departments were active members of the RSG of which ten participated.

At the time of both surveys, it was estimated that about 185 nurses were in day-to-day contact with patients at the Flemish radiotherapy departments. The questionnaire was completed by sixty-seven nurses in 2001, representing approximately one third of the total population of radiotherapy nurses and 59% of the nurses who were asked to participate. In 2006 eighty-eight nurses completed the questionnaire, representing almost half of the total population and 65% of the nurses who were asked to participate.

Instrument

A questionnaire was developed after an inventory of the skin care recommendations in the literature, complemented by the expert opinion of Flemish nurses working in this field.

The instrument consisted of 58 items, grouped in four sections (Table 1). In the 2006 survey, three questions from the 2001 survey concerning wound dressings in case of moist desquamation, were dropped because they were about obsolete techniques no longer used in 2001. These questions were replaced by one new question dealing with a more modern technique.

The answer categories consisted of a four point Likert scale (never, sometimes, a lot, always). The questionnaire had at least one open-ended question in each section to give subjects the opportunity to describe alternative techniques not listed.

Table 1

Structure of the questionnaire.

| Content questionnaire | Number of items |
|---|-----------------|
| Preventive advice | 21 |
| Advice when erythema is present | 9 |
| Advice when dry desquamation is present | 11 |
| Advice when moist desquamation is present | 17 ^a |

^a For the 2006 survey there were only 15 items in this category.

Demographic data were also collected by means of the questionnaire. These data included age, sex, number of years working at the department, additional education on radiotherapy and the level of nursing education. In Belgium there are two levels of nursing education with a graduate degree representing the higher level.

Data analysis

Demographic data and other independent variables were compared using the Chi-square (sex, education level and having followed additional education) and the student *t*-test (age and the number of years working at the department). The latter variables were also presented as means and standard deviations.

Changes in clinical practice between 2001 and 2006 were analyzed using the Chi-square test or the Fisher's exact test if one or more cells had an expected count of less than five. The four response categories were transformed into dichotomous variables representing always/a lot on the one hand and never/sometimes on the other hand.

The three omitted questions in the 2001 survey and the new question in the 2006 survey were analyzed in a descriptive way by presenting the cumulative frequencies.

A *P*-value of *P* < 0.05 was considered statistically significant. Adjustments for missing data were not done since only 1.7% of the values were missing in the 2001 survey and 2.8% in the 2006 survey.

Results

Because we focussed on the use of outdated and controversial techniques and the adoption of the key principles mentioned above, only part of the 58 items of the questionnaire were presented in the results.

Demographic data (Table 2)

There were no differences between the two surveys for age, sex, years working at the department and education level. In 2006 the number of nurses having followed additional courses in radiotherapy was significantly higher.

Advice for the prevention of skin reactions (Table 3)

Avoid to wash the irradiated skin was one of the traditional practices nurses frequently recommended in 2001. The incidence of this advice decreased significantly in 2006. Also, the number of nurses advising the patients frequently to use mild soap increased significantly.

We noticed that advising to use talcum powder in skin care almost disappeared from practice. Prohibition to use any kind of creams or lotions decreased significantly between 2001 and 2006.

Table 2
Distribution of demographic and other independent variables.

| Variables | Number of nurses (%) | | P-value |
|---------------------------------|----------------------|---------------|---------|
| | 2001 (n = 67) | 2006 (n = 89) | |
| Sex | | | |
| Male | 20 (30%) | 29 (33%) | 0.876 |
| Female | 43 (64%) | 59 (66%) | |
| Unknown | 4 (6%) | 1 | |
| Age | | | |
| Mean ± SD | 35 ± 9 | 37 ± 9 | 0.247 |
| Years working at the department | | | |
| Mean ± SD | 8.5 ± 7.7 | 9.5 ± 8.1 | 0.452 |
| Education | | | |
| Graduate | 45 (70%) | 72 (81%) | 0.072 |
| Certificate | 15 (23%) | 11 (12%) | |
| Nurse Assistant | 3 (5%) | 3 (3%) | |
| Other | 1 (2%) | 2 (2%) | |
| Additional education | | | |
| Yes | 26 (41%) | 54 (61%) | 0.014* |
| No | 38 (59%) | 35 (39%) | |

* Statistically significant value.

Advice when erythema is present (Table 4)

Regarding the advice to avoid washing the irradiated skin we noticed a similar significant decrease compared to the preventive advice. The number of nurses instructing a lot or always to use Eosin 2% or talcum powder, two other conservative practices, reduced significantly.

The use of hydrating creams was becoming common practice in 2006 showing a significant increase. A similar result was seen for the advice to avoid lotion with a non-significant decrease of 25% of nurses advising this a lot or always.

The instruction to use occlusive wound dressings increased significantly to 22% in 2006. The recommendations to use hydrocortisone cream was not frequently given in both surveys while the use of almond oil fell by half (non significant finding).

Advice when dry desquamation is present (Table 5)

Also in this stage of skin reaction, we saw a significant decrease in the number of nurses giving always or a lot the advice to avoid washing. A significant increase of the use of hydrating creams and occlusive wound dressings was shown. Recommending to apply hydrating creams seemed well integrated by the Flemish nurses, however specific hydrating products such as aloe vera, chamomile cream, almond oil were rarely advised to patients.

Practices which showed a significant decrease were the recommendations to use silver sulphadiazine and talcum powder. Hydrocortisone cream was hardly recommended in both surveys.

Advice when moist desquamation is present (Table 6)

In 2006 the use of occlusive wound dressings increased significantly and became a widespread technique. Together with

Table 3
Preventive advice: % of respondents indicating always/a lot.

| | 2001 n = 67 | 2006 n = 88 | P-value |
|---------------------------|-------------|-------------|---------|
| Avoid washing | 45 | 10 | <0.001* |
| If washing, use mild soap | 64 | 88 | <0.001* |
| Use talcum powder | 30 | 2 | <0.001* |
| Use almond oil | 34 | 26 | 0.249 |
| Avoid ointment or creams | 81 | 50 | <0.001* |
| Avoid lotion | 74 | 51 | 0.005* |

* Statistically significant value.

Table 4
Advice when erythema is present: % of respondents indicating always/a lot.

| Advices | 2001 n = 67 | 2006 n = 88 | P-value |
|----------------------------------|-------------|-------------|---------|
| Avoid washing | 44 | 20 | 0.001* |
| Use hydrating cream | 24 | 68 | <0.001* |
| Avoid lotion | 64 | 49 | 0.063 |
| Use Eosin 2% | 57 | 12 | <0.001* |
| Use hydrocortisone cream | 1 | 5 | 0.230 |
| Use talcum powder | 16 | 3 | 0.009* |
| Use almond oil | 31 | 15 | 0.142 |
| Use of occlusive wound dressings | 6 | 22 | 0.006* |

* Statistically significant value.

washing it became the most frequent advice given by nurses in this stage of skin reaction. Headstrong ritualistic practices like the use of Eosin 2%, talcum powder, silver sulphadiazine and Gentian violet decreased significantly and seemed to disappear from practice. Also the advice to use hydrocortisone cream was almost non-existent. However, the use of silver sulphadiazine was still recommended on a regular base by almost one third of the nurses (30%).

The use of hydrating creams was rarely advised in 2001 (1%) and 2006 (10%) but nevertheless showed a significant increase, which did not correspond with the guidelines for moist desquamation.

Discussion

The results of the second survey showed a large improvement in adherence to evidence based guidelines. However, it was also shown that some recommendations were not adopted by a large number of nurses.

Overall, both surveys showed that nursing practice for the management of skin reactions varied among radiotherapy departments and nurses of the same departments. This might confuse patients, undermine trust in care and caregivers and compromise prevention and healing. However, there seemed to be less variations in the 2006 survey (data not shown). In the past, practice recommendations have been guided usually by historical practices and individual opinions. The 2001 survey and the dissemination of the protocol might have contributed to an increased focus on skin care. This might have stimulated radiotherapy departments to implement recommendations leading to less practice differences in 2006. Despite this improvement, it is clear that continued efforts are needed to keep focus on skin care and further reduce the differences.

Areas where practices differ, are comparable to other studies exploring the management of skin reactions (Barkham, 1993; Lavery, 1995; Bolderston, 2003). These areas are the use of washing, soap, topical agents and in the management of dry and moist desquamation.

Washing

The advice to avoid washing the irradiated site decreased significantly between 2001 and 2006 in all stages of skin reaction. It

Table 5
Advice when dry desquamation is present: % of respondents indicating always/a lot.

| Advices | 2001 n = 67 | 2006 n = 88 | P-value |
|--|-------------|-------------|---------|
| Avoid washing | 40 | 16 | <0.001* |
| Use hydrating cream | 29 | 65 | <0.001* |
| Use aloe vera | 0 | 3 | 0.263 |
| Use hydrocortisone cream | 1 | 6 | 0.239 |
| Use chamomile cream | 1 | 7 | 0.140 |
| Use silver sulphadiazine (Flammazine®) | 35 | 10 | <0.001* |
| Use talcum powder | 13 | 0 | <0.001* |
| Use almond oil | 25 | 16 | <0.001* |
| Use of occlusive wound dressings | 4 | 31 | <0.001* |

* Statistically significant value.

Table 6

Advice when moist desquamation is present: % of respondents indicating always/a lot.

| Advices | 2001 n = 67 | 2006 n = 88 | P-value |
|---|-------------|-------------|---------|
| Avoid washing | 73 | 30 | <0.001 |
| Use hydrating cream | 1 | 10 | 0.044 |
| Use talcum powder | 18 | 0 | <0.001 |
| Use almond oil | 2 | 2 | 1.000 |
| Use Eosine 2% | 61 | 15 | <0.001 |
| Use Gentian Violet | 11 | 2 | 0.022 |
| Use hydrocortisone cream | 4 | 3 | 1.000 |
| Use silver sulphadiazine | 62 | 30 | <0.001 |
| Use chamomile cream | 0 | 1 | 1.000 |
| Use hydrocolloid dressing | 10 | | |
| Use polyethylene dressing | 3 | | |
| Use Rivanol compress | 3 | | |
| Use of occlusive wound dressings ^a | | 67 | |

^a In the 2005 survey the questions 'use hydrocolloid dressing', 'use polyethylene dressing' and 'use Rivanol compress' were replaced by one question: 'use of occlusive wound dressings'.

was stated in the protocol that gentle washing (with or without a mild soap) should be encouraged in all stages because it leads to a significant reduction of skin reactions and patients feel more comfortable (Campbell and Illingworth, 1992; Roy et al., 2001; Schratte-Sehn et al., 2001; Westbury et al., 2000). However, it is important to emphasize that washing needs to be gentle, using the hand instead of a wash cloth and patting the skin dry with a soft towel.

Although the practice of washing the irradiated area changed in a positive way, a considerable number of nurses remained advising to avoid washing. In case of moist desquamation this was even 30% of nurses. The prohibition to wash the irradiated site is a historical practice that was based on the arguments that patients might use irritating soaps while washing, rub to harshly causing mechanical injury or accidentally remove the skin marks (Porock and Kristjanson, 1999; Westbury et al., 2000).

Skin hydration

Hydrating the skin by means of topical agents for prevention or management of erythema and dry desquamation has been recommended in the literature since a long time (Campbell and Lane, 1996; Hassey and Rose, 1982; Hilderley, 1983; Korinko and Yurick, 1997; Naylor et al. (2001); Sitton, 1992; Strohl, 1988). Many topical agents were being tested but the evidence on which topical agent should be used remains inconclusive (Fisher et al., 2000; Halperin et al., 1993; Lokkevick et al., 1996; Maiche et al., 1991, 1994; Miko Enomoto et al., 2005; Pommier et al., 2004; Porock & Kristjanson, 1999; Wells et al., 2004). The lack of evidence to support one product over another is mainly due to a paucity of randomized controlled trials. An exception is the use of Aloe vera which has been the subject of study in three randomized trials (Heggie et al., 2002; Olsen et al., 2001; Williams et al., 1996). A systematic review by Richardson et al. (2005) which included these studies, lead to the conclusion that there was no evidence to suggest that topical Aloe vera could prevent or minimise radiation-induced skin reactions.

A large randomized study by Wells et al. (2004) compared 357 patients receiving either aqueous cream, sucalfate cream or no cream from the start of treatment and who were instructed to wash with mild soap. They found no significant differences between the treatment arms in acute skin toxicity and symptom burden. Importantly, they found several factors which increase the risk of developing severe skin reactions. Although there is no evidence to support the use of the topical agents to prevent or minimise skin

reactions, they are found to promote patient comfort (Porock and Kristjanson, 1999). Therefore we recommended its use in our protocol in the earlier stages of skin reaction. In 2006 the use of hydrating creams showed a significant increase compared to 2001. Despite this positive result, still a considerable number of nurses advised not to use creams, ointments or lotions. This was probably due to the belief that the application of creams or lotions may cause a bolus effect resulting in more severe skin reactions. However, this was refuted by Burch et al. (1997) who concluded that no significant increase in surface dose could be measured. Furthermore, the use of modern linear accelerators and more advanced techniques should obviate the concern of a bolus effect.

Powdering the skin

The use of talcum or other powders on the irradiated skin is controversial and research on this topic is scarce. There is no evidence available to either refute or support their use. Schreck et al. (2002) found no difference in onset and degree of skin reactions or symptom relief when comparing the use of powder and cream in twelve patients treated for head and neck cancer. Reasons for not recommending powders might be the increased risk of irritation, infection and severe skin reaction due to particle scatter (Campbell and Lane, 1996; Korinko and Yurick, 1997). The latter is more than likely not a valid argument because of the modern radiotherapy equipment and techniques (Burch et al., 1997; Lavery, 1995).

Our protocol stated that for the prevention and management of erythema and dry desquamation other techniques such as hydrating the skin are preferred over the use of powders. This recommendation seems well implemented since this practice nearly disappeared in 2006.

Corticosteroid topical agent

Despite of the protocol recommendation to apply hydrocortisone cream in case of skin inflammation, both surveys showed that this was not followed by the large majority of the nurses. The opinions about the value of topical corticosteroids in treating skin reactions vary in literature. Some authors recommend against their use because of the risk of delayed healing, atrophy and telangiectasia, systemic absorption and secondary infection (Boström et al., 2001; Dunne-Daly, 1995; Sitton, 1992). Others suggest to apply these creams only to reduce itching, pain and burning sensation (Campbell and Lane, 1996; Dunne-Daly, 1995; Korinko and Yurick, 1997; Naylor et al., 2001). Also, the evidence from research studies is contradictory. While Boström et al. (2001) showed a significant decrease of acute radiation dermatitis when using such cream compared to an emollient cream, other authors did not show significant positive effects (Glees et al., 1979; Poetra et al., 1982; Schmuth et al., 2002).

A possible reason why this technique was not often recommended by nurses in Flanders is because they perceived that advising this kind of creams was the physicians responsibility. After all, these creams should be prescribed by a physician.

Eosin 2% and Gentian violet

Moist care is the standard of care when moist desquamation appears, which is contradictory with the use of Eosin 2% and Gentian violet effectuating a dry wound. Skin coloration which makes wound assessment difficult and the carcinogenic risk of Gentian violet are additional reasons why these products should be avoided (Campbell and Lane, 1996).

In 2001 the use of Eosin 2% was popular in Flanders to treat erythema and moist desquamation but its use was not supported in the protocol. In 2006, a drastic decrease in the number of nurses instructing to use Eosin 2% in case of erythema and moist desquamation was observed, but still respectively 12% and 15% of the nurses remained to their attitude. The recommendation to avoid Gentian violet was well integrated because it almost disappeared from practice.

Silver sulphadiazine

In 2001, the use of silver sulphadiazine ointment was the most popular technique when dry or moist desquamation occurred. No studies exist that assess the use and benefit of this technique in radiation skin reactions. Reasons that advocate against its use are the risk of allergic reactions, traumatic dressing change and skin coloration (Bugmann et al., 1998). Also, it is indicated for use in full-thickness wounds only, while a radiation moist skin reaction is a partial-thickness wound. For these reasons its use was not supported in the protocol and a preference for the use of occlusive dressings was stated. Following the dissemination of the protocol a significant decline was noticed. However, 30% of the nurses still used this technique frequently in case of moist desquamation.

Occlusive wound dressings

Moist wound care is the standard care when moist desquamation occurs because wounds heal more rapidly in a moist environment by promoting cell migration (Dyson et al., 1988; Margolin et al., 1990; Miller, 1998; Strunk and Maher, 1993). This was shown by Gollins et al. (2008) who concluded that hydrogel dressings are more likely to heal radiotherapy-induced moist desquamation in the head and neck region and are better tolerated than Gentian violet. Margolin et al. (1990) showed also benefits from hydrocolloid dressings on moist desquamation in terms of wound healing time and comfort. Mak et al. (2000) could not show any benefit in healing time for hydrocolloid dressings compared to Gentian violet but found that dressing comfort was significantly better for the hydrocolloid dressing.

Hydrocolloid or polyethylene dressings were poorly recommended in 2001. In the open-ended section of the questionnaire however, one third of the nurses (31%) mentioned advising non-adherent silicone dressings (data not shown). The 2006 survey showed a significant increase in the use of occlusive wound dressings in case of moist desquamation. However, still one third of the nurses did not frequently recommend the use of dressings.

Limitations to the survey

Completing the questionnaires at the hospital could be a source of bias because there may have been some influence from other nurses on site. This could have been avoided if questionnaires had been sent to the nurses' homes. On the other hand this might have affected the response rate which tends to be lower when questionnaires are mailed.

Another possible source of bias was that some nurses might underestimate the importance of giving information. Moreover, they might reason that because of the availability of written brochures patients did not need additional oral information. Others might decline patients certain kinds of information because they felt it was a medical problem (e.g. the use topical corticosteroids).

A common problem with questionnaires is that respondents might fake good answers, also known as social desirability or obsequiousness. Respondents may systematically alter questionnaire responses in the direction they perceive to be desired by

the investigator while socially undesirable answers tend to be underreported. This problem could be countered by designing an observational study for the evaluation of nursing practice regarding skin care.

The study sample existed of nurses working at a radiotherapy department. However, nurses working at oncology hospital departments or in homecare also come across problems of skin reactions due to radiotherapy. The protocol was also disseminated in these groups but they were not included in the study sample. Furthermore, to get a complete picture of skin care during radiotherapy medical doctors should be surveyed as they play a significant role.

One can question if the changes in practice seen in this study can be imputed exclusively to the dissemination and implementation of our protocol. Both national and international professional organisations and journals publish articles or hold presentations about this topic which could have an effect on nursing practice. Moreover, the significantly higher number of nurses who followed additional courses on radiotherapy in the 2006 sample may have influenced the results.

Implications for the future

The development of clinical practice guidelines and protocols is an important step in an attempt to increase the quality of nursing care. This can only be realized if these guidelines are converted into day-to-day practice by nurses. The results showed a significant improvement in the adoption of evidence based recommendations regarding the prevention and management of skin reaction during radiotherapy. On the other hand, it was shown that some of the recommendations stated in the protocol need better implementation in practice. This suggests that the protocol was not fully implemented by all departments. A possible explanation is that a detailed implementation plan was missing or that departments were not supported to implement the protocol. The implementation process was largely determined by the person who proposed the protocol in his department and the support of the head nurse and medical staff. In some departments this was clearly the case and this was done in a structured way with regular meetings, presentations and discussions coordinated by the work group member. However, this was not the case in all departments.

For the moment the RSG is working on an update of the protocol. In parallel a plan to support the dissemination and implementation in the radiation facilities will be developed. Key issues in this plan will be the development of a user-friendly implementation tool, a simple document describing all recommendations and their rationale, and the organisation of activities such as presentations and workshops. Consequently, evaluations measuring the adherence to the recommendations will be planned.

Conclusion

The results of this survey showed that the management of skin reactions in Flanders is undergoing major changes. Old fashioned techniques that were frequently used in 2001 are (slowly) disappearing from practice (e.g. the use of Eosin 2%, talcum powder). Key principles of skin care such as skin hydration, washing the irradiated site and the use of occlusive wound dressing were getting more and more implemented in daily clinical practice. Although high levels of compliance were reached for some of the guidelines this was not the case for all guidelines. For example, a considerable number of nurses still advised against the use of creams, ointments and lotions. This is probably caused by the lack of clear research results and, more importantly, the lack of adequate translation and implementation of these results into specific

radiotherapy departments. Therefore sustained efforts to implement recommendations are necessary.

There is a clear need for more research to obtain hard evidence for supporting or refuting the use of several skin care techniques. For example, the use of hydrating products and corticosteroid cream during radiotherapy needs to be explored further. Although the application of the principles of moist wound healing is appropriate, research about which dressings to use remains inconclusive.

Changing practice is a long-term process which needs a structured approach and the translation of research results into practice. The dissemination and implementation of the skin care protocol enhanced standardization in Flanders but progress needs to be monitored and altered as needed.

Appendix. Supplementary material

Supplementary data associated with this article can be found in the online version, at doi:10.1016/j.ejon.2009.10.006.

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